The PHOENIX Framework for Air Quality Modeling and Policy Analysis

Dan Loughlin
Environmental Scientist
ORD/NRMRL/APPCD/APB
(919) 541-3928
loughlin.dan@epa.gov

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The EPA's research and regulatory analyses of ambient air quality often make use of computer models to simulate requisite elements of the system. For example, in a regulatory impact analysis of a proposed policy, we employ a number of models to do the following:

- project future economic growth and generate the associated future emissions levels;
- develop and apply control factors to future baseline emissions and process these baseline and controlled emissions (i.e., temporal and spatial allocation);
- conduct air quality modeling to characterize future ambient concentrations of pollutants such as PM and/or ozone; and
- evaluate the incremental health and environment effects associated with changes in air quality and value those benefits for comparison with the cost of control requirements.

Research applications involve a similar set of modeling activities.

Although performing analyses using a suite of models is not difficult to envision, it has proven to be challenging in practice. For example, various models employ different data formats, use different time and spatial scales, execute on different computing platforms (e.g., PC versus Linux/Unix workstation), and have sufficiently long run times that make their use for "timely" analyses difficult. Another factor is that, because many of the models are sufficiently complicated, they are run by different teams in different parts of the overall organization. This may lead to problems of inconsistency if the data and assumptions made by the various teams are not in agreement.

An alternative modeling approach is to make use of an integrated modeling environment that links the various modeling activities or analytical components of the system. Such an environment would include explicitly defined interfaces between models, would automate data transfers and model execution (across computing platforms, if necessary), would facilitate optimization as well as sensitivity and uncertainty analysis, and would provide a toolbox of analysis techniques for accessing and visualizing data inputs, intermediate outputs, and policy results.

ORD and OAR are currently collaborating on an effort to develop such an integrated modeling environment. The software framework, called PHOENIX, is built upon the EPA's Multimedia Integrated Modeling System (MIMS) framework. PHOENIX is expected to play a role in supporting OAQPS's regulatory impact analysis of the PM NAAQS and may be used within ORD's Climate Change Air Quality Assessment.

The poster will provide an overview of PHOENIX, including a discussion of the objectives, status, and potential applications of the framework.